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ORAL HISTORY TRANSCRIPT

Dr. A.N. Khosla 143

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ORAL HISTORY PROJECT

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Sd/-
(A. N. Khosla)

SIG. ____________

DATE March 22, 1973.

Bio-data

KHOSLA, Dr. Ajudhia Nath, B.A. Engg. (Hons.), C.E. (Hons.) (Roorkee), Dr. Instt., (Honorary), Rennselaer Polytechnic Instt., U.S.A., Dr. Engg. (Honoris Causa), Roorkee Univ. (1959), D.Sc. (Honoris Causa), (1954), Punjab Univ. (1961), Padma Bhushan (1955), Ex-Governor of Orissa; Vice-Chancellor, Roorkee Univ., (1954-59); M.P., (1958-59).

b. Dec. 11, 1892.

Educ.: D.A.V. Coll., Lahore; Thomasson Coll. of Civil Engg., Roorkee.

Joined (1916) the Irrigation Branch of the Punjab Government; worked with the Mesopotamia Expeditionary Force in Iraq, (1918-1920); worked in different capacities till August 1943 when he became Chief Engineer and Secretary to the Punjab Government; Spl. Secy., Govt. of India, Min. of Irrigation & Power, (1953); Founder Pres., Intn'l Commn. on Irrigation and Drainage, (1951-54); Hony. Pres., Bhakra Board of Consultants since 1952; Beas Board of Consultants since 1961; Chairman: Board of Consultants for Sabarigiri (Kerala); Ramganga and Yamuna Projects (U.P.); Pres., National Instt. of Science, (1960-62); Member, Plng. Commn., (1952-62).

Publications: Levelling of Precision Across Rivers - Evolved the Khosla Disc; Design of Weirs on Permeable Foundations; Silting of Reservoirs; Rainfall and Runoff; Pressure observations under Dams; Precast Concrete Through Roofs.

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Main points covered in the interview

Early irrigation projects in Punjab and research; status of Indian engineers and Britishers in twenties and thirties; establishment of Central Waterways Irrigation and Navigation Commission; Hirakud and Bhakra projects and contact with Jawaharlal Nehru; Nehru's ideas on science; Gandhi views on modern technology (1946); Canal Water Dispute with Pakistan (1954); experiences of working with Nehru in Planning Commission; recollections of Nehru; Institution of Students Aid and Loan Fund and research facilities at Roorkee University; on "brain drain"; criticism of bureaucracy under Nehru; Nehru and technical education; IITs; Research in science, basic and applied, and national laboratories; Nehru's principal scientific advisers after Independence.

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Oral History Interview
with
Dr. A.N. Khosla
Delhi, India
23 August, 1968
by
Mrs. Aparna Basu
for The Nehru Memorial Museum & Library

Mrs. Aparna Basu: We are very grateful to you, Mr. Khosla, for coming and speaking this time and recording this interview for us.

Dr. A.N. Khosla: Thank you very much.

Basu: You joined the Irrigation Branch of the Punjab Government in September 1916, I find. I am sure you had some very interesting experiences there, which you would like to tell us, especially discrepancies the Indian engineers in this period faced from the British?

Khosla: Yes, I would be glad to say something about my past history. I joined the Punjab Irrigation Department on 27th September 1916 and was posted as an Assistant Engineer for the investigation and surveys of the Bhakra-Dam Project. Well, that project was going to be the life and blood of the Punjab, and I appreciated that opportunity. I spent about a year and a half on that project and during that period I marked the axis of the Dam on which the Dam was eventually constructed, from 1947 onwards.

In 1918, I volunteered for War service and was the first Indian who was given a Commissioned rank as an engineer. Three others of the same rank accompanied me. At that time, they asked me to come as a non-Commissioned officer. But my reply even at that time was : I would rather resign my job than go as a non-Commissioned officer. The stress of War was such that they could not refuse and they accepted me. After that, I went to Mesopotamia, I did some original work and won the approbation of the British people. I came back to India in 1920 and was given the job of Executive Engineer and was given the Discharge Division. After that I was put on the Sutlej Valley Project survey and investigations, where we did a certain amount of original work. At the close of that, I was the first Indian to be given the opportunity of doing construction work on a dam, which was the Sulemanki Headwork. They had finished it in that period. I made certain new innovations in the matter of reinforced concrete and other things, and went to Marala. That Headwork was in need of many modifications and the problem of drainage was acute, which I solved successfully. During my stay at Marala, I got interested in the theory of lower waters through

the sub-soils, which was baffling most Punjab engineers, and perhaps the engineers of the world. And from 1926 to 1936, I carried on with these investigations. In 1936 I brought out my book Design of Years on Permeable Foundations , which was in the hands of all engineers in the world, and has now become a classic. Well, between these two periods, I was appointed, as a temporary measure, to do some reconstruction of the Khanki Weir because the British engineer there had fallen ill. The programme was to finish it in two years, and I finished it in six months. After that, I went to the Secretariat as Under-Secretary and during that period the question of building the Trimur Barrage cropped up. Well they wanted a very able engineer with dynamism and vision, and the Chief Engineer at that time picked me for that. There were three European engineers, two in one group and one in the other, and it was a man in the other group who picked me. The other two Chief Engineers were unhappy over my choice because they felt I would certainly do the job and give credit to the other Chief Engineer whom they did not particularly like. Also it would blaze the trail for the Indian engineers to take up more responsible jobs. Responsible jobs to Indian engineers were denied at that time. We

were put on some unimportant jobs, nothing by way of construction, nothing by way of policy-making. So there was going to be a departure. Then they in fact asked me to refuse the offer and they would give me immediate promotion. But I declined saying that I have given my word of honour and I must stick by it. But ultimately I did get the job and within two years, I with six other Indian engineers completed the whole of that construction. The opening ceremony was done after a period of one year 11 months and 10 days. Normally, the British engineers took 5-6 years for construction of a similar barrage. Now the incentive for this sort of effort was, that in the very early days of my service, about 1917-18, I attended one of the Engineering Congress, Punjab Engineering Congress, and found that whosoever spoke there was a Britisher and if an Indian got up to raise a point, he was sort of pooh-poohed. This hurt my feeling. It hurt my pride as an Indian, and it egged me on to more and more effort that if I got a lift, it would not be merely because I am an Indian, but because I am as good as the Britisher or if anything better. Well, in that attempt, I won two gold medals of the Punjab Engineering Congress, and two gold medals of what they called, Kennedy gold medal. The same dashing

spirit which I had egged me on to complete the construction of this Trimur barrage in record time of two years. After that I was sent to Europe for the second time. The first time was in 1931. This time it was in 1939. I came back just after the War had begun. On return, I was appointed as Superintending Engineering, High Dam Construction, over the head of about a dozen engineers, and of course a number of Indian engineers. But it was an out of the cadre job; so nobody could object. After spending four years on that, I was made the Chief Engineer again over the head of four Europeans and five Indians. I need not go into the details of it, but the main thing was that after the construction of the Trimur barrage, the Indian engineers had created a deep impression on the Punjab Government and the Punjab officials which also went outside the Punjab. They started preferring us to British engineers. Even the British Chief Engineers started preferring the Indian engineers to the British counterparts. So that was a great change in our social status, in our engineering status, and the discrimination of which we had been victims all these years seemed to have suddenly disappeared.

From 14th August 1943 to February 1945 I was the Chief Engineer of Punjab and was responsible for most of the projects which were carried out later on, including the Bhakra Dam Project, Beas Dam Project and several other projects. In the meantime, I had the opportunity of negotiating a water-agreement between the Punjab and the United Provinces, and also between Sind and the Punjab which later on developed into the Indo-Pakistan Canal Water Dispute. I was very fond of working on the Bhakra Dam because I started my life on that. But, in the meantime, a new proposal cropped up, where they wanted to set up a Central organisation, named the Central Waterways Navigation and Irrigation Commission, and they were seeking a Chairman of this project. As usual, the British engineers had in mind one of their own group, but Dr. Ambedkar, who was the Member in-charge of Labour and Public Works, wanted an Indian. In the process of discussing the question of a barrage on the Jamuna river, I had come in contact with Dr. Ambedkar, the Viceroy, and the Chief Commissioner of Delhi. Dr. Ambedkar somehow took a liking for me, and he asked me why I could not take up the Chairmanship of the Commission. I declined because,

I said, the Government of the Punjab has made me a Chief Engineer specially in the interests of the Bhakra Dam and it might be considered as a betrayal of trust, if I leave at this stage. So I recommended a couple of other Indian engineers, but he turned both of them down. This went on for six months, and after six months he put the question: "Are you going to take it, or not? If not, I am going to put in a Britisher." Now that seemed to touch a soft spot in me and I decided I would take the job. Of course, I pleaded with the Governor, the Revenue Minister, the Chief Minister of the Punjab to relieve me, telling them that going to the Centre will in fact help the Bhakra Project and not hinder it. Well, with reluctance, they accepted my plea, and joined the Central Government in February 1945 and started the Central Waterways Irrigation and Navigation Commission, with just one orderly and one stenographer. Now, of course, it has become a big organisation. I was on that job till the end of 1953, when I was sent out to the USA to deal with the Canal Water Dispute with Pakistan. During that period, I formulated most of the river valley projects, some of which have been executed by now, some of which are under construction or in the project stage and some of which might be taken up later. It is also during this period that I initiated, or rather conceived,

the project for the conservation and utilization of the waters of the Mahanadi river with Hirakud Dam as the first stage of that project. That project was conceived in May 1945 and was completed some time in 1956 - exactly 11 years from conception to completion. It is in the context of these two projects that my first contact with Jawaharlal Nehru was made.

Basu The Bhakra and Hirakud?

Khosla Yes.

Basu When did you really first meet Mr. Nehru? Can you recall any particular incident or occasion?

Khosla For the first time, I met him in 1945 and again in 1946, and the very first thing we discussed was how best we could develop the natural resources of India. I was working on these river valley projects, the Bhakra Dam and the Hirakud Dam were very much on his mind. Of course apart from many other projects like Kosi, Chambal, DVC and others. He showed very keen interest in this and his grasp of things was so good, that I could not imagine that a man who has not had an engineering or the scientific background - of course I did not know at that time that he was a student of science - could so readily grasp what I told him; and some of the observations

he made were really of a very highly technical nature, not that he had that knowledge, but somehow he had that instinctive build-up which made him put his finger on the right spot and make the right suggestion. And from that onwards, we became friends, and he was very fond of me. He never turned down a single proposal, right from 1945 to 1964, till he died. I understood him; he understood me, and he knew that my interest was not personal; my interest was for the country and so was his. So that was the common ground. Now, in this connection, I might mention that about the same time I came for the first time in contact with Gandhiji. I had listened to his lectures earlier and like everybody else, I was completely swayed by what he said. In fact, when I was in Mesopotamia, he was arrested, and as a Commissioned officer, I could not say a word or give expression to my feelings; but somehow I did manage to express something to some people, and the matter was communicated to the Government of India. But all of us felt that it was a tragedy that such a saintly man was being prosecuted by the British. Now, as to my meeting with Gandhiji, I will come to that little later.

Basu Now, why do you, Mr. Khosla, think that Nehru placed so much importance on science? Was it because he was a student of science or do think that his interest was really because he wanted to modernize India and he thought that science and technology were the right means of doing it?

Khosla He was a student of science, which of course I discovered only later when I came in touch with him. But, apart from that, he was a very shrewd observer of human behaviour and human needs. He was brought up in that atmosphere, and I had occasion to read his 'The Discovery of India' - which, I think, was written by Jawaharlal Nehru, somewhere in 1942 and printed in 1945, - and in that you find that he had a very shrewd understanding of the impact of science and technology on the Western world, and of its translation to India if he could possibly do it. And he wrote - I would like to repeat one of the parts of the speeches which he gave as Prime Minister of India, when he directly took over of charge, and he said: "It is science alone that can solve the problems of hunger and poverty; of insanitation and illiteracy; of superstition and deadening custom and tradition; of vast resources running to waste of a rich country

inhabited by starving people. Who indeed could ignore science today? At every turn, we have to seek its aid. The future belongs to science, and to those who make friends with science." Now that was the background of his thinking, directly he became Prime Minister, and that became the corner-stone of his policy as the Prime Minister of India almost till the day he died.

<u>Basu</u> Now, do you know of any other Indian political leader who placed same importance on science and technology as Nehru?

<u>Khosla</u> Well, there were only two other Indian leaders with whom I came in touch - and of course quite a large number of them, I knew, but I did not have intimate contacts with them - and one of these was Dr. Ambedkar. He was a lawyer, and not necessarily well versed in science, but somehow he had an intuitive feeling that without science and technology India cannot progress. That is why, he was so keen on the scheme of development, which included first of all the setting up of this water-resources - Water and Power Commission - and he was instrumental in accelerating the pace of certain scientific organisations. Now, the second man who I felt that had this deep understanding of science and technology was Gandhiji himself. People

generally believed that Gandhiji had no faith in machinery and also no faith in these modern technologies, but I think they were completely mistaken. Now, if you take, for example, the concept of basic-education; that is nothing but dissemination of science and technology amongst the masses. In my interview with him some time in 1946 - Sarat Chandra Bose took me there; he was our Minister at that time - I put the direct question to him: "Bapuji, would you have any objection to our use of heavy-machinery in the construction of the Hirakud or the Bhakra Dam, because people feel that you are opposed to machinery?" His reply was: "I am opposed to machinery only in the sense that it tends to make the machine the master of man, and man slave of machinery. But if machinery is used in the service of man; to give him higher standard of living; higher status, dignity of manhood, then I shall have certainly no objection." Then I put to him the further question: "Do you think there can be happy blend of machinery and manpower?" He said: "So long as you do not subordinate man to machinery, it is perfectly all right and also if it is in the interests of the nation." So that made me feel

that basically he had correct understanding of science and technology. As I have said before, basic education which we people have not appreciated was really the foundation for laying a scientific base at the rural level, at the primary level; and once that base is built up, then everything grows. We have started from the top-down and the result is that science and technology, and more particularly science, have taken some sort of root in the upper strata of life, but the rural population is completely out of it; it is only in the context of agricultural development that the rural population is wakening up. So I would say that among the people I came in touch with, among the leaders of men, Dr. Ambedkar was one, and more than him, was Mahatma Gandhi. Well, I just recollect, now Lala Lajpat Rai was yet another, but I did not have so much of intimate contact with him.

<u>Basu</u> What about some of the other sort of local leaders of Punjab when you were working? Did they show any interest in the sort of work you were doing; the Ministers ....?

<u>Khosla</u> Well, the Ministers were keenly interested in these projects particularly Sir Chhotu Ram, who was the Revenue Minister at the

time I was there. Somehow that man was not liked by the Hindus and he had perforce to go into the fold of Muslims because both of them were working together for the uplift of the rural masses. But when I go back, in retrospect, evaluating the real status of Sir Chhotu Ram, I feel that his ideas were very much the same as Gandhiji had. He was for the poor, he was for the agriculturists, and he was against the big money-bags who manoeuvred all the laws and regulations of the country and also did not hesitate to exploit the less privileged people; and in that I feel, I think, that Ambedkar was at once with him.

Basu Now, going back to Nehru, though Nehru was not a practising scientist, in what way do you feel that his personality revealed his scientific temper?

Khosla Well, his approach to problems was all scientific. When I say scientific, I mean, he did not accept things as they were put to him; he did not accept things because they were in the written book somewhere; he did not accept things because they came through tradition; but he wanted to check everything for himself and find a rational basis for accepting or rejecting a thing; and in everything, whether it was science and technology

or other human affairs, his approach was the same scientific approach.

Basu Now, during the year that you were with the Government of India here in Delhi, you were yourself in charge of very important subjects that were closely related to scientific research and development. How did Nehru react to the various schemes and projects that you had to discuss with him? Can you give us some resume of any of the discussions?

Khosla Well, I have covered a very wide range of responsibilities while at the Centre. The first 8 or 9 years were spent in water-resources development which means, irrigation, navigation, development of power. Incidentally also agriculture, which included the best use of water for agriculture,-removal or water-logging, drainage, reclamation of alkaline soils, and so on. And that period covers from February 1945 to, I should say, September 1953. From September 1953 to September 1954, I was engaged in this Canal Water Dispute between India and Pakistan, and I had to spend most of the time in U.S.A. On return from there, I took over as Vice-Chancellor of the Roorkee University, an Engineering University from which I graduated in 1916. It is a little bit of digression-but when I took over charge of the University in 1954, I found the same conditions existing as in 1916. The same old equipment, the same building,

and the same few teachers, excepting that the military had put in a number of barracks during the World War II. I was shocked to see the condition of things, and it had been transformed into a university. So I felt a little humiliated that instead of maintaining its tradition, a century old tradition, of being the best institution in India and one of the best in the world, it was going to degenerate into a mere college, and that also perhaps not as good as some of the new institutions that had come up. And that was another incentive ~~one~~, another stimulant, much the same as I mentioned to you earlier; the stimulant of discrimination between Indians and the Britishers. Here was a stimulant that the fabric, which was of the highest order for a whole century was in the danger of collapse for want of proper action and guidance. So I took upon myself as a sacred duty to rebuild that University; and during the 5½ years that I was there, I am happy to say, the University was completely transformed. A whole lot of buildings costing roughly 10 crores of rupees have come up; new branches of Engineering; new branches of sciences, and, what is more important, the scientific effort that has been put in there today,is something as good as anywhere else in any university in India.

Perhaps much better because it is more on the applied side than on the basic side. Well, from there, again at the request of Nehruji, I was called in as Member of the Planning Commission to take charge of Education and Scientific Research. Well, that was not an entirely new field to me, because even as an engineer I had done quite a good bit of original research and published some papers. In the University of course I was a teacher as well as a Research Director. So it came to me more naturally than I thought but I was hesitant all the same. Quite a number of suggestions which I made, Panditji accepted. But, one of my main grouses about the working of the Planning Commission was, that while we were putting out very good plans, very good schemes, the implementation factor was weak. The result was we were not able to make the amount of impact that we could have made on the economy of the country. The planning of manpower, planning of resources, everything was perfect on paper, but where things went wrong, was in the utilization of those resources and the stress on priorities. I am hoping things are better now; they look better. If we can change our orientation, so that planning

and implementation go side by side and there is somebody to watch these, I think with the potential we have created in this country there is unlimited scope for development and we can make progress in a matter of a few years, which normally we could not achieve in a couple of decades or more. Perhaps this is some digressing but let me go back to the question again.

Now, one thing about Panditji, was that in all his public speeches, whether related to science and technology, irrigation works, industries or humanities, his stress was on the scientific temper and the climate of science, because he felt that among other things this was the major factor which would make all the difference between slow progress and rapid progress; the difference between dragging on poverty and disease and hunger for an indefinite period and getting over of these hurdles in a matter of couple of decades.

Basu When you were a Vice-Chancellor for more than 5 years at Roorkee did you invite Mr. Nehru only at the convocation?

Khosla I invited him twice. Once it was to lay the foundation-stone for the refresher courses. It was a new concept in education, in

our universities, and that has worked wonderfully well. The second time, was to address the convocation of the university, at which time we conferred the degree of Doctor of Engineering on Nehru. And the second time, he donated 1500 rupees out of his personal money for what we call the Students' Loan and Aid Fund. Now, in passing I might mention there were two new things which I introduced in that University, which I wish were introduced in all the schools and colleges of India. One was the Students' Loan and Aid Fund. In engineering education, in fact in all education, once a student gets a B.A. degree or M.A. degree, or something like that, he thinks it below his dignity to do anything with his hands. Now, when I was in America and Europe and other countries, I discovered that the children of the multi-millionaires used to earn their own pocket money by selling newspapers or by doing some odd jobs, even dish-washing. Here even the children of middle-class people hesitate to take up a glass of water for themselves; they must order the servant to bring it. Well I thought, that was just contrary to what we called 'human dignity'. I had the idea that each boy and girl - I introduced girl students also in that University when I went there - so long as he or she was physically fit,

must do a certain amount of manual labour for a certain period during the week. I specified two or three hours, 2 - 3 periods, per week, generally on Saturdays, Sundays, where the students could get together and build up amenities for themselves. During 3½ years of this, what we called 'Shram Dan', these students made a full size Olympic swimming pool; an open air theatre to seat 3000 people; a water tank 75 ft. above the ground level to feed the whole of campus; a sports-pavilion, three big halls as addition to their club; each about 40 ft. x 90 ft., then a hobby centre, again a very big hall. Then the roads and gardening. All those things they did. They cost us only about 2-3 lakhs, but the buildings at that time were worth 8 lakhs, and today it will be of the order of 20 lakhs. Now, on top of that, we started a Hobby-centre where students could do some creative work; and we had prizes for everything as incentives, and that came in the shape of marks. So that anybody who got so many more marks, got the higher division. To begin with, the students objected. They said, this Vice-Chancellor is a slave driver; he wants to make coolies of us. But within 15-20 days, they reconciled themselves to this, and as things went up, they got thoroughly enthused. If their parents

and friends came, they took them round and said, this is what I did, this is what my class-mates made, this is what my class did. So they were proud of it. Panditji inaugurated the water-tower which was built, I think, by the second-year or third-year class at practically no cost, because we gave them material, which was redundant all over the University; the expertise was given by the teachers, and the labour by the students, and the senior students also provided the expertise in the matter of designs and other things. Now this was one thing.

The second innovation was the setting up of a Loans and Aid Fund for the students. Technical education is very expensive, and Roorkee is the most expensive of all. In those days, it used to cost 200 rupees a month. In my days, it cost Rs.100 a month. So quite a number of people came there because they had a future. Their parents sold their houses, their lands; their mothers sold their ornaments. They were all sort of caught between doing work or worrying about their means. They did not get money in time. So we decided that let us put up a pool of resources, and make that available to the students in need; it will be on loan basis; it will be a debt of honour; they

can repay to the extent they got it, or they can pay it twice over, or they can give it 10 times over. The thing has worked. I think today they have helped engineers to the order of 500-600 students. And it was to this Fund, Panditji contributed 1500 rupees.

Another thing I might mention. I was earning quite a sizable amount in consulting fees. Well I had no use of money because my children were grown up, and we lived in a poor style, we did not spend extravagantly. So I decided to hand over all that money for creating a research atmosphere in the University. During the five years that I was there - and I continued it while I was the Member, Planning Commission - my contribution was of the order of a lakh and fifteen thousand rupees. To that, we added something else. Not it stands at about two lakhs. We provided incentives for the research workers at the University. Now we are going to liberalise it and open it to the rest of India also, whereby a man who does outstanding research work in a year, can get up to 5000 rupees cash straightaway. Other people get it in lower order, some 500, 1000, or a certificate of merit or maybe a gold medal or a silver medal. These are some of the outstanding

innovations I introduced there, and I wish they could be introduced in all the schools and colleges. That is, dignity of labour; all students to work. This new institution which I am talking to you about, we are introducing it there right from the beginning. The second thing is "help the poor to help themselves". The third is research.

Basu . When Panditji was alive, he saw a number of best scientists and engineers were migrating to Europe and America. What was his reaction towards this migration? Could'nt he check it?

Khosla Well, this matter has been discussed in great detail at the CASTASIA meetings. But, as I see it, and I put it before that, and I have got that huge book with me here, there are various factors. There is the economic factor. The second important thing is the factor of freedom of work, opportunities for work. And the third factor is the social factor which is connected with our inferiority complex which has permeated so deep into our society that we cannot think of an Indian being something of a super-man at any time. If we want to think of a super-man, it must be somebody from the West. Now I will explain to

you how. Now a number of students go out from here, and some because they feel that the degrees obtained in America and England and France and Germany have more value here in the Selection Committees than the degrees obtained in India. Then the third thing is that research opportunities are relatively limited here - limited in magnitude and limited in scope. Then another factor is when these boys and girls go for studies outside, they soon get appointments as Assistants or Lecturers or some sort of things and there is the "earn and learn" benefit. Everyboy studying in the schools and colleges can put in a couple of hours and make a few dollars, and that helps them a long way. Even poor parents can afford to send away their brilliant children. By and large, anybody who goes with technical qualifications from here, gets a job almost immediately. This is true of engineers, of scientists, of medical people, though not so true of other professions. It is quite common for a graduate from here, a first class man, to get 500-600 dollars almost within six months of his reaching there, and he can go up to 700-800 dollars, or 1000 or even higher. Then the opportunities for research are wider in scope, but what is more important, is more freedom of

action. There is not that spirit of bossism which is hindering our growth here. Here if one is a teacher, he thinks everything produced, maybe by his colleagues, or teachers and students, must go in his name. There, that thing does not exist. There is freedom of work, there is help and there is recognition of work, and nobody wants to butt in, to put his own name because he has been the Director. If he has done some work, yes he might put his name. But normally they do not. Now about salaries, they get about 10 times the salary, in America, than they get here. But having been in contact with a large number of these people in various fields - in fact in all fields, not only engineering and technology and medicine, but in all humanities also, because as Member of the Planning Commission I was in touch with most of these people - now they would come back; ~~would come~~; if they were getting, say, 1000 dollars there, they would be too happy to come for 1000 rupees here, or even less, provided they had freedom of action, and they were not kept down because of red-tapism and the rules and regulations which are the common features or common curse. Of course, there are difficulties of equipment, but those equipment difficulties are not insurmountable, because

indigenous things have grown up and a man, who is really keen on doing research, can fabricate his own. I mean, these sophisticated instruments have come in now. Even without them, most of the discoveries in the world had been made, and they can be made. Then the other trouble here is, we have not developed that team spirit which exists in the foreign countries. Here there is an element of jealousy. Oh, this man has done something better. So instead of crying him up, we will cry him down. I think that is a common failing in our Indian attitude and outlook. We do not, we deify political heroes and all that for a time till they are in office. But apart from that, if we want to make a reference for any good thing in the world, it is never an Indian; it is always a foreigner. Howsoever small he may be, but he is better to us than the highest of Indians. That is the mentality which is keeping us down; which is continuing that inferiority complex, and therefore inhibiting our innovation, initiative and high performance. The creative urges exist here as much as other countries; I have seen that; I have developed certain people who have gone up to very high positions, and they were considered as 'duds'; but the encouragement given is very little. And one of the faults - I am

digressing - in our administrative set-up is that it is not what you call a spirit of help, but a spirit of brakes. Everywhere we want to check and counter-check and counter counter-check, with the result that most of the efforts of the scientists, engineers and others are spent in meeting these objections, and playing safe lest something should happen. Therefore the best of them cannot put their whole heart into the work, and they cannot take a bold decision to do something out of the common, because if they make a mistake, they are hanged and if they do something good, there is no appreciation. It is a common thing not only in science and technology, but probably in all spheres of our activity, and that is a thing which has to be radically changed if India really wants to advance. I might be talking heresy. It might hurt many feelings, but I have that experience of fifty two years. I have done some very big jobs. I have created certain things. I have done a lot of research. I have been in position of Secretary of a Government, Member of Planning. So I know all the difficulties which I have felt as a junior officer, and not from my own people but from Britishers. But

inhibitions exist today in, I say somewhat a worse form than they did in the British days. Things have expanded so far, but we have not come up to the standard to hold these things in check. There are more brakes than forward movements.

Basu And do you think that Mr. Nehru played some part in lessening these brakes of the bureaucracy, of these obstacles?

Khosla Well, he did his very best. But the administrative set-up which we have inherited from the British has not improved; it has got a little worse in the point of delays, in the point of red-tapism, in the point of brakes and counter-brakes. So, in spite of his best efforts, he could only do a certain amount of improvement, but not to the extent of making a break-through in the development process. I remember cases - I do not know whether I should speak it out; but there is no harm. There was a certain time when I wanted to do recruitment immediately after Partition, and the only people available were from the Punjab, because half of Punjab had nothing to do. So I recruited the best I could. There were no other people available from the other States. The Minister in charge at that time - I would not name him - he objected, not because he had doubts, but because one of the underlings made him feel, that I am bringing in Punjabis

to the exclusion of others. Now we did our very best to get people from all over India, but nobody came, no Government would spare then. So Nehru asked me: Well, what is obstructing your work? Well, to him I talked, more or less, as my elder brother - he was three years my senior - and I never thought that he was the Prime Minister and I was just a small fry, but talked to him frankly, and so I told him the difficulty. And the next day he sent a stinker to this Minister, and a copy to me, which was most embarrassing to me. After that I never spoke to him about these things, in frank terms as I did before because it creates complications. Well, the Minister was of a high calibre. He did not call me, and he did not scold me, and he did not show any sign of misunderstanding. He treated me just the same; in fact, he treated me a little better. It showed that he was a big man. But that was the sort of thing. If difficulties came in the way, and were brought to Nehru's notice, he took immediate action. Sometimes however he took an action which might have jeopardized the whole process of forward movement because of these internal troubles coming in. I had a number of occasions like that, and everywhere his decision was prompt, to the point, and he wanted to implement it. I know people have

been telling me that he was, as his sister put it in Parliament, a 'prisoner of indecision', that he delayed everything, letting things take their own time. But my impression was different. In matter of science and technology and everything relating to development, he was very quick and his instructions were clear. Now if things got bogged down, it was at the lower levels, and of course he could not keep in touch with everything. But I must say to his credit he had infinite energy; he could work almost 24 hours in the day and still not feel tired, and his relaxation was meeting people, talking to intellectuals, getting reports. In fact, he asked me to send fortnightly reports of everything I had done, and he religiously read them. I remember one instance in connection with the Canal Water Dispute. I sent him a file at 7 o'clock one evening - it took me about 7 days to prepare it. Next morning at 6 o'clock I got it back, with clear instructions covering about 4-5 pages, and on that basis we proceeded. He remembered more of the case, than I did, who was dealing with it all the time. You asked him after 4 months, he would repeat exactly what he said before, which I could not do; most other people could not do.

<u>Basu</u> So that really his understanding of these problems was great.

<u>Khosla</u> Oh, yes. May not be that detailed understanding of things because nobody is expected to do that. But in the broader sense, it did not matter how complicated the matter was, whether it was in connection with dams, canal works, industry, atomic energy, he understood the thing. Having understood it, he could put it before the people, and put it to you even better than you yourself could so. That is a real qualification I have seen in a man.

<u>Basu</u> And that he could so quickly dispose of things, means he took such great interest in things.

<u>Khosla</u> His mind was alert all the time. It is only towards the end that he faded down a bit. That was after the Chinese invasion. A definite change came over him. But even then he would listen to you for 5 minutes, then doze off for 5 minutes, but his understanding was so clear that even with that break for dozing off, you could think that he was listening all the time. I have not come across a more remarkable man than him.

<u>Basu</u> During his time, a chain of IITs came into operation, and there must have been high-powered conferences or meetings. What was his anxiety to open these institutions, and how did he

manage? He contacted Russia, Germany and a number of other countries.

Khosla The need for expansion of technical education was great; we were short of personnel. Now, of course, there is a glut - it is only a temporary glut, but there is a glut - but at that time we were terribly short of higher cadres; scientists and engineers, of high type. We had a number of insti institutions here, the technical institutions, of which one was the University of Roorkee which was world famous. Then there was Institute of Preventive Medicine at Guindy, one in Maharashtra and the Sibpur College of Engineering. They were of a high order. So the idea came that we must have some centres of excellence and we had to go at a fast pace in order to produce engineers, technologists and scientists. So this idea of IITs came in. It was, I think, at the instance of the Indians, who were policy-makers (and I was one of them), the idea of having the Americans, the Germans, the French and the British, and also I should say, the Russians, originated. So we set up these IITs, and each of them aided one institution. For instance, the Kanpur IIT is American. Then the IIT, Delhi is British. The one at Madras is German and the one at Bombay is Russian.

And the idea was to have more IITs. But just now they have cried halt, because of the over-production. But the main thing is if we want to take science and technology to the really high level of the Western countries, then we must get high class scientists and high class engineers and technologists. Science and technology have to work together because science alone will give you nothing - it will give you abstract ideas - and technology without science can go a certain limit, but beyond that it stops. But this is a growing process. Now we are in the nuclear age, the space age. Things are completely different. Now ideas are coming in; now materials are coming in; new processes are coming in; new armaments are coming in. For that you want the best type of people. I can tell you that India is capable of producing that highest type, provided we take steps to stream-line administration and give proper stimulus and incentives to the scientists, engineers and technologists; much of the same kind of stimlus that I gathered of my own because of discrimination by the British and because of the decaying condition of the University when I went there.

Basu And what about this chain of national laboratories that we started after Independence all over the country? Do you think it was sort of a good idea or could the same sort of research have been established in the existing universities?

Khosla Well, you have asked a very pertinent question. There are two things. The imported research, basic and applied; and the indigenous research. These national laboratories were meant to serve mainly the function of applied research. The idea at that time was that the universities would take up all the basic research or at least the bulk of it, and these laboratories will do a certain amount of basic research which is very necessary for their applied research, but mainly devote themselves to applied research. But, unfortunately, at that time the basic research in the universities had no developed to a stage where these laboratories could draw upon it. Therefore, basic research became in the beginning, a major part of their research; now of course it is falling off; it is more applied than basic research. But because of that initial beginning, with too much of basic research and very little of applied research, the general tilt in thinking has been more to basic

than to applied. Now basic research is something which we can borrow. Applied research we can borrow only in a limited way, because applied research means handing over of patents and processes- and nobody is going to do it for nothing; even if foreign firms give it, they must keep something so that they do not lose their markets. Therefore, if we want to advance as a nation, in the scientific and technological field, we have to produce our own indigenous research of a high order. In that research we need not waste money, in reinvesting money, in things which have been done outside in repeating the discoveries which have already been made; or in doing some fashionable work which will attract attention of the world, but may be of no use to us here. These are the things which have been discussed at CASTASIA also. But the idea of these laboratories was a sound one; it has provided a base, and if we reorientate our policy, these national laboratories can become the laboratories of the future for all development. Research and development go together, but the development part can be the function of these. If we go about it the right way, not only the national laboratories, but the Indian Council of Agricultural Research, Defence laboratories, and various laboratories of

research all over the country, their energies can be directed more towards production. In other words, towards application rather than to merely create ideas. And if that can be done, I think there is a bright future for the country. I would like to quote you one instance. During the World War II, the Americans were in a fix. So what they did was, to appoint one man as a superman.- he was an engineer-to take charge of all scientific research and development for Defence purposes, and all the engineers, scientists and development agencies were put under his control. I have for-fotten his name just now. And in a matter of two or three years, he produced results which would have taken two or three decades. It was a crash programme; everybody worked to schedule; they knew exactly what they had got to do; the problems were brought in, solved and resolved; new problems came in. That is the sort of thing that we have got to do in our country, not merely for Defence but even for peace purposes. If the realisation of that comes properly to the people, I think within a matter of 10 years, we can make a break-through.

Basu And do you think that we have been really able to stimulate interest in science and technology in our country since Independence in the two decades?

Khosla We have done a great deal in developing our indigenous technology, rather than depend entirely on foreign know-how and foreign collaboration. But, even now, by and large, most of the industries are going to foreigners, if they can. If the Government policy puts them down, they don't. But, of their own volition, they would prefer to go outside rather than to take discoveries made here. The fault is that there has been no liaison, or very little liaison, between industry and research. In fact, research people have been working in the so-called ivory-towers, not in the sense of a university but very much like it. They have not gone out to propagate their ideas and tell industry of their efforts or, found out the problems of industry and assured them of a solution; and helped them to put up pilot plants and production units. Now that thing has been lacking and that thing has again been stressed in the CASTASIA discussions. But, by and large, you have got a big pool of scientists and technologists, and if their energies are oriented the right way, they can produce results which might be spectacular so far as we people in India are concerned. It is a question of policy, direction and orientation. But

where we have lagged is in the awareness of science amongst the masses - 70-60% of population is rural - science and technology are all limited in these industrial centres, or the urban areas. That is where Gandhiji's task of basic education was really basic in nature, and I wish we could go back on to that, in some way; not merely throw it away because it was somebody's ideas and like khaddar, it is also obsolescent. If we understand the spirit behind it - and I feel Gandhiji was a man who could see through things, who understood human nature and who understood what India required; we want to go back to that in a more modern, scientific way - and if we can spread that culture amongst the people, then much can be achieved. Once their spirit of inquiry is stimulated, everybody is capable of creating lots of things. Young children can create things. Scientists at a graduate level can create things - and these creative ideas come to you at that stage much faster than at an advanced stage.

Basu One more thing. Who were really Nehru's principal Scientific Advisers immediately after Independence? Who were the people who advised him on various matters?

Khosla To begin with I would start by

saying that I was the eldest. Then came Shanti Swarup Bhatnagar. Then came Homi J. Bhabha. And then of course a host of others. P.Mahalanobis, S.Bhagvantham, Megh Nath Saha, and a number of others. I do not remember the names. But he did not pick his men merely because somebody recommended them to him or somebody boosted them up, but because he somehow saw some merit in them. He had a sense of discrimination. I know people have said that he was a bad chooser of men. Well it may be correct in certain cases - maybe in the political field - but so far as the science and technology are concerned, I think his instinct was unerring.

<u>Basu</u> Thank you.

<u>Khosla</u> Thank you very much.